# INTT Electronics and Construction

RIKEN/RBRC
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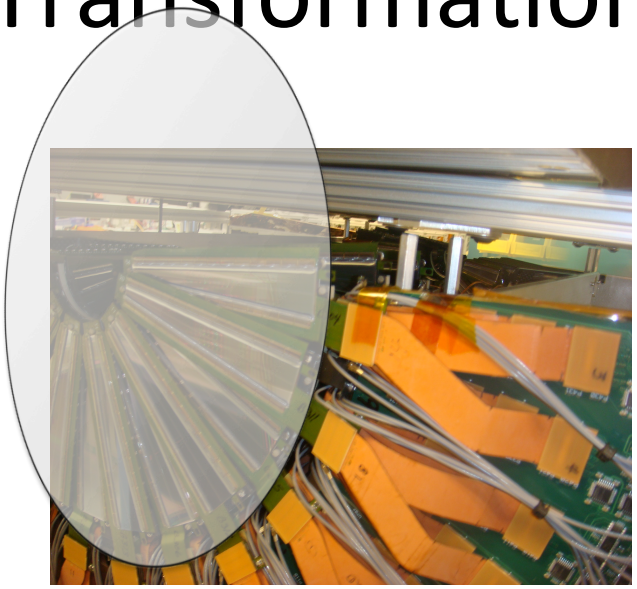
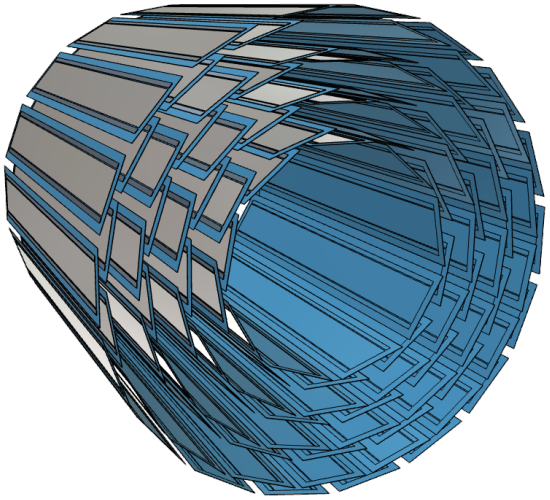
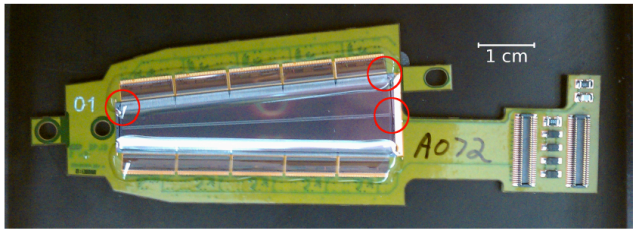
# Transformation of FVTX to Barrel Tracker



Disk Type



Barrel Type




Trapezoid Shape

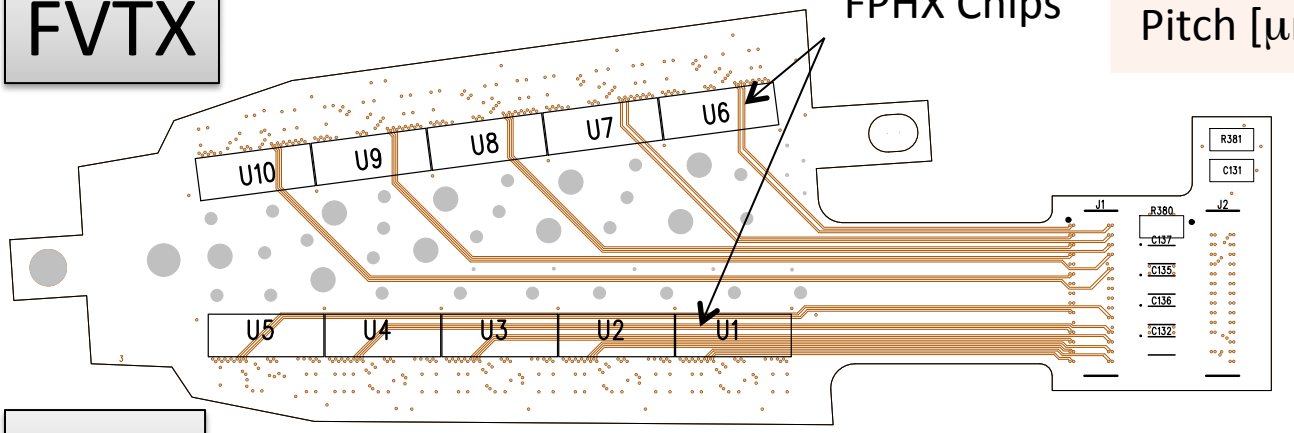

Rectangular Shape

The shape of the sensor and readout HDI bus of FVTX are modified in order to accommodate the barrel type geometry for the INTT. The electrical design will be the same.

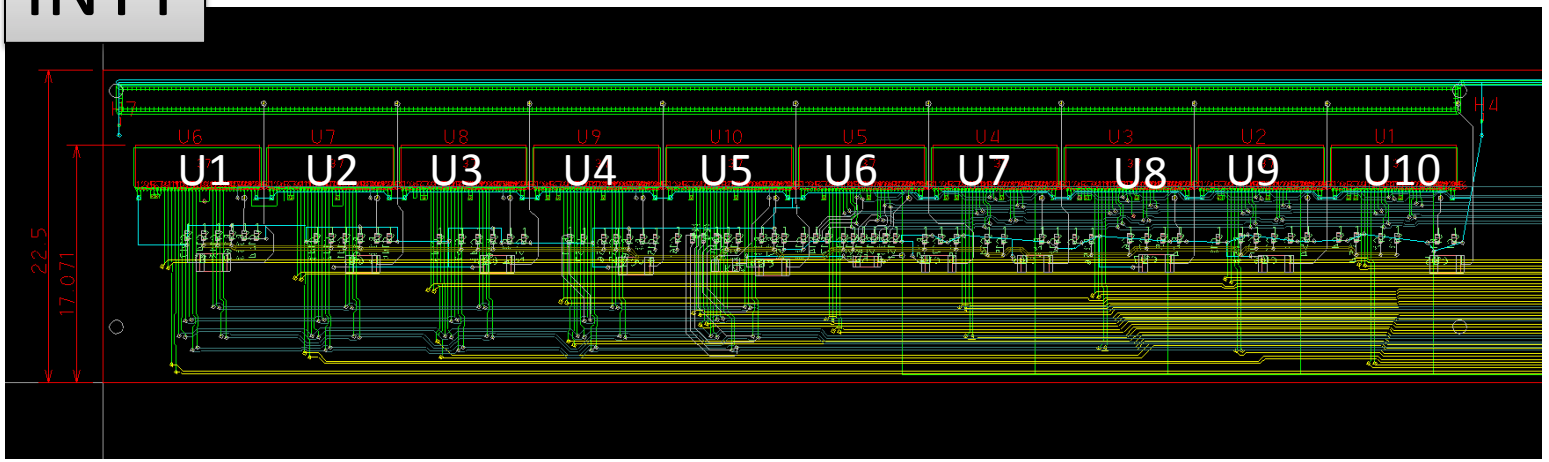
# INTT HDI Design

| | FVTX | INTT |
|---|---|---|
| # Layers | 7 | 7 |
| Pitch [μm] | 40 | 60 -> ? |

FVTX

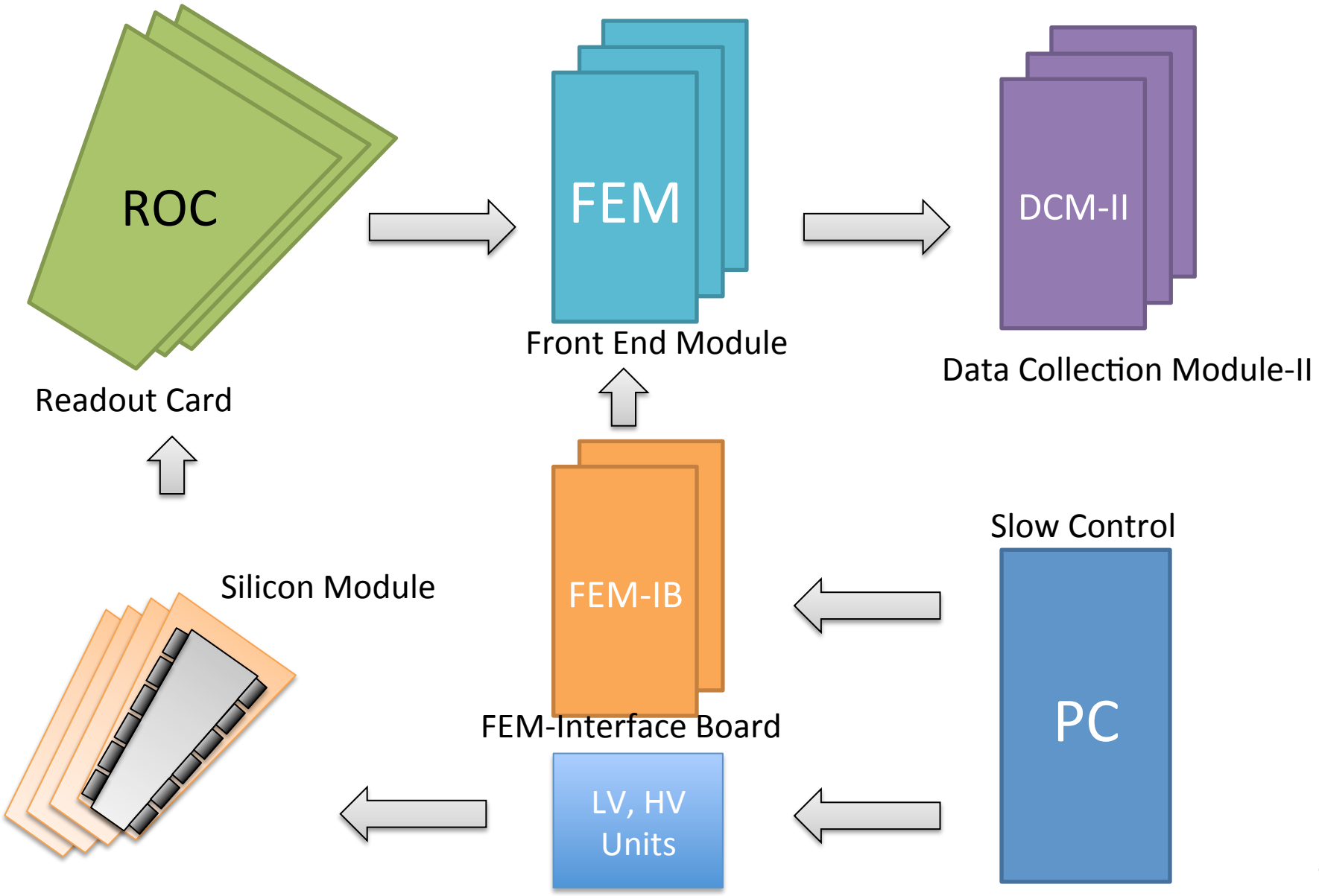



INTT



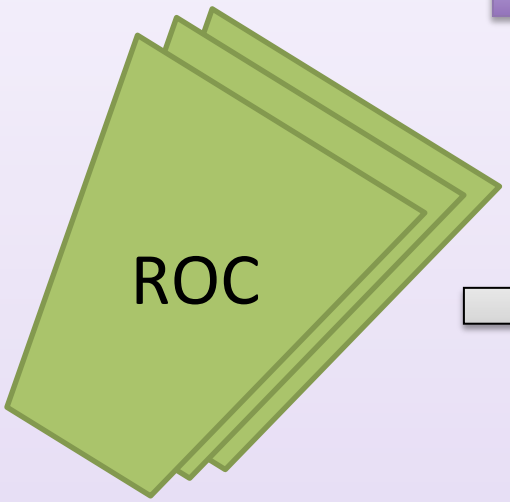

The INTT HDI prototype circuit is designed based on the FVTX circuit drawing. The line spacing pitch for FVTX was the cutting edge 40μm, but this was fixed for INTT due to relatively relaxed geometrical constraint.

# FVTX Readout Chain



# INTT Readout Chain Similar to FVTX

Components of the FVTX readout chain will be adapted for the INTT

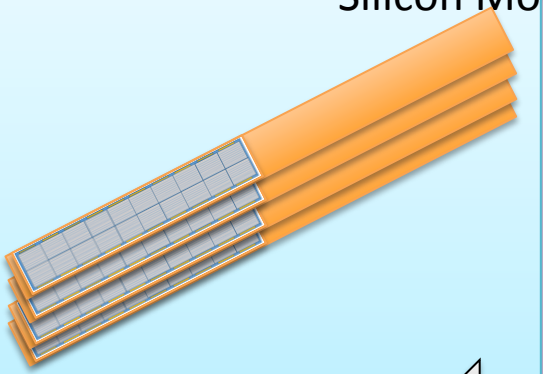


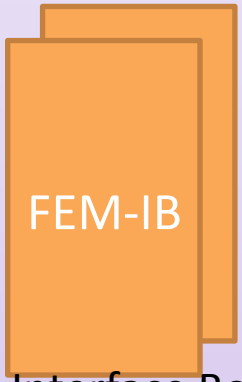

Readout Card


Front End Module


Data Collection Module-II

Silicon Module





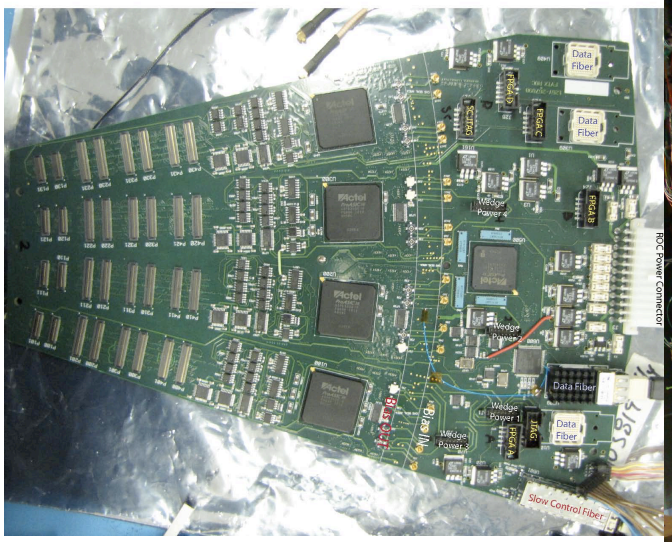

FEM-Interface Board

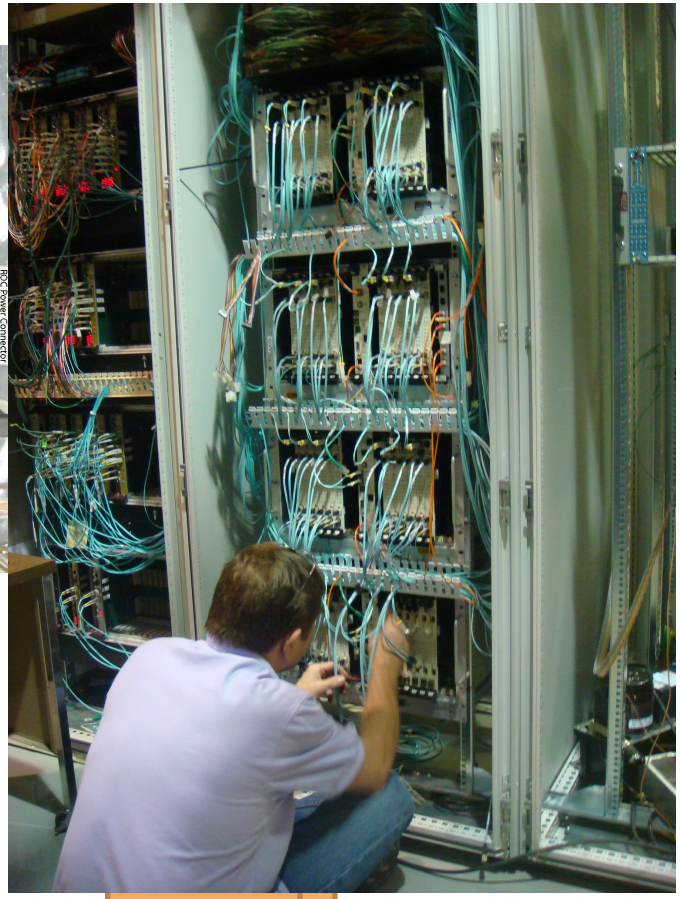
Slow Control



Only this part needs to be developed

# INTT Readout Chain



DCM-II

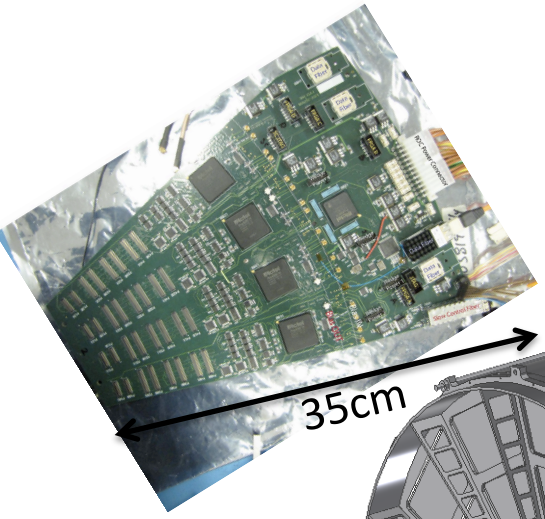
Slow Control

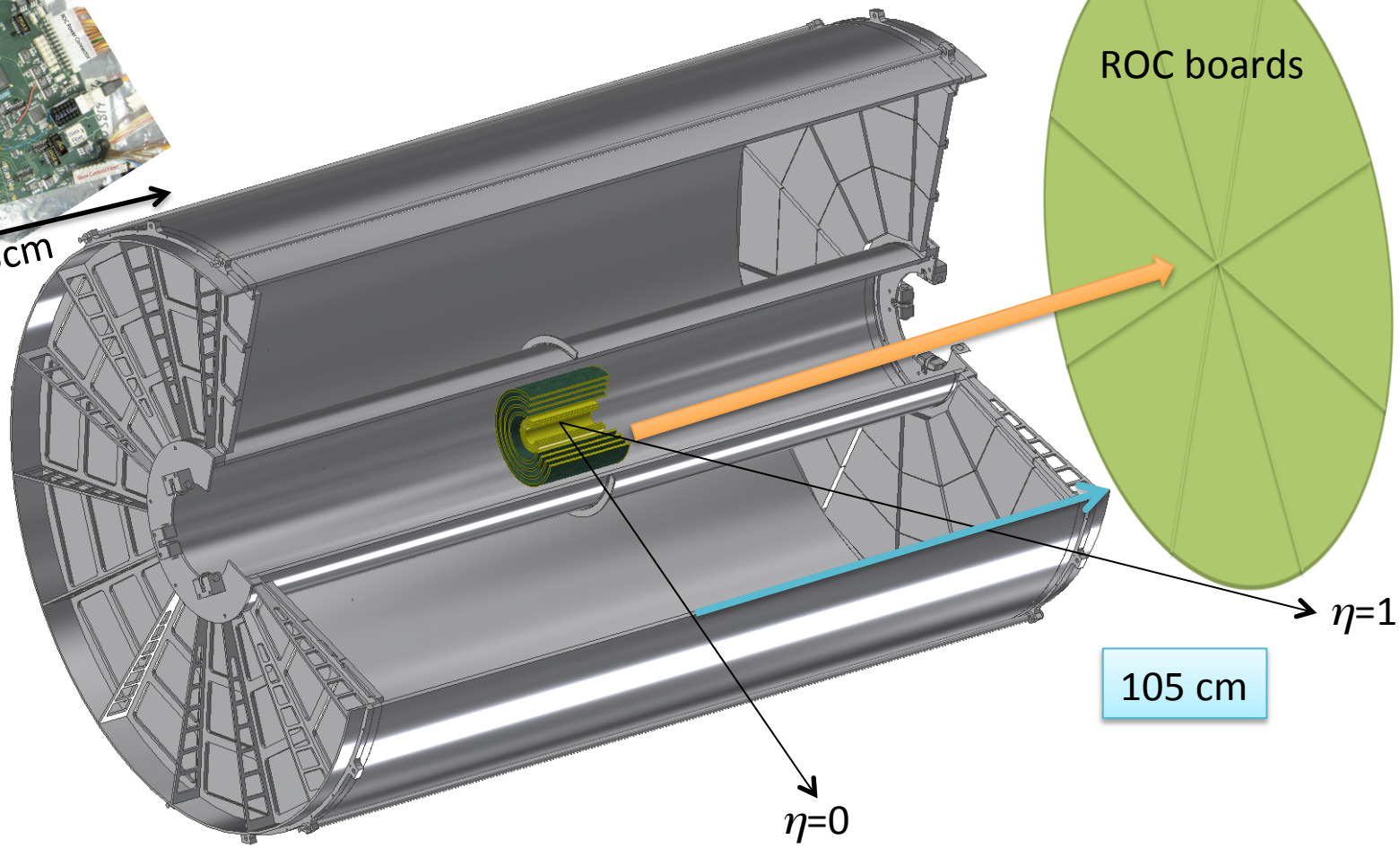
PC

The entire read-out chain of FVTX system will be re-used in INTT. This will reduce the technical risk and cost.

Silicon Module

# ROC Engineering

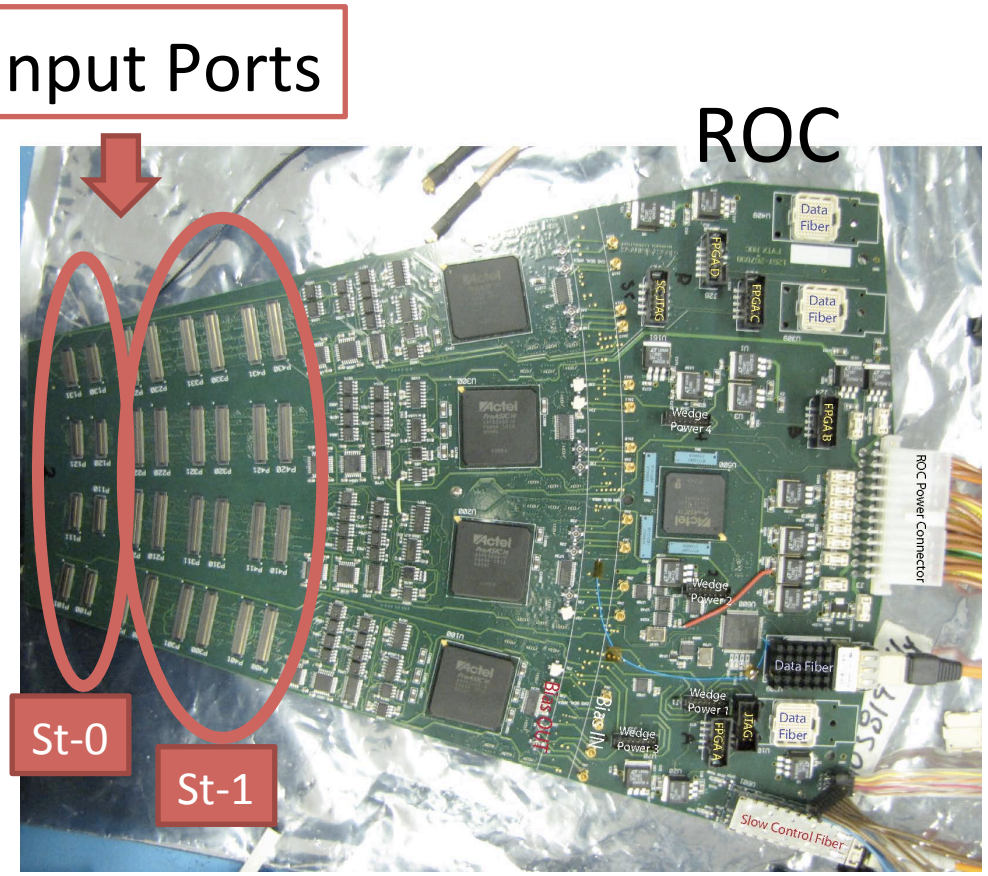



Engineering study is necessary to determine the location of the ROCs due to the space constraint inside the tracker system (MAPS, ITS and TPC). We need to use a bus extender which will be connected between HDI bus and ROC (around 90- 100 cm). A Conservative technology will be applied for the bus extender.

# BUS Extender

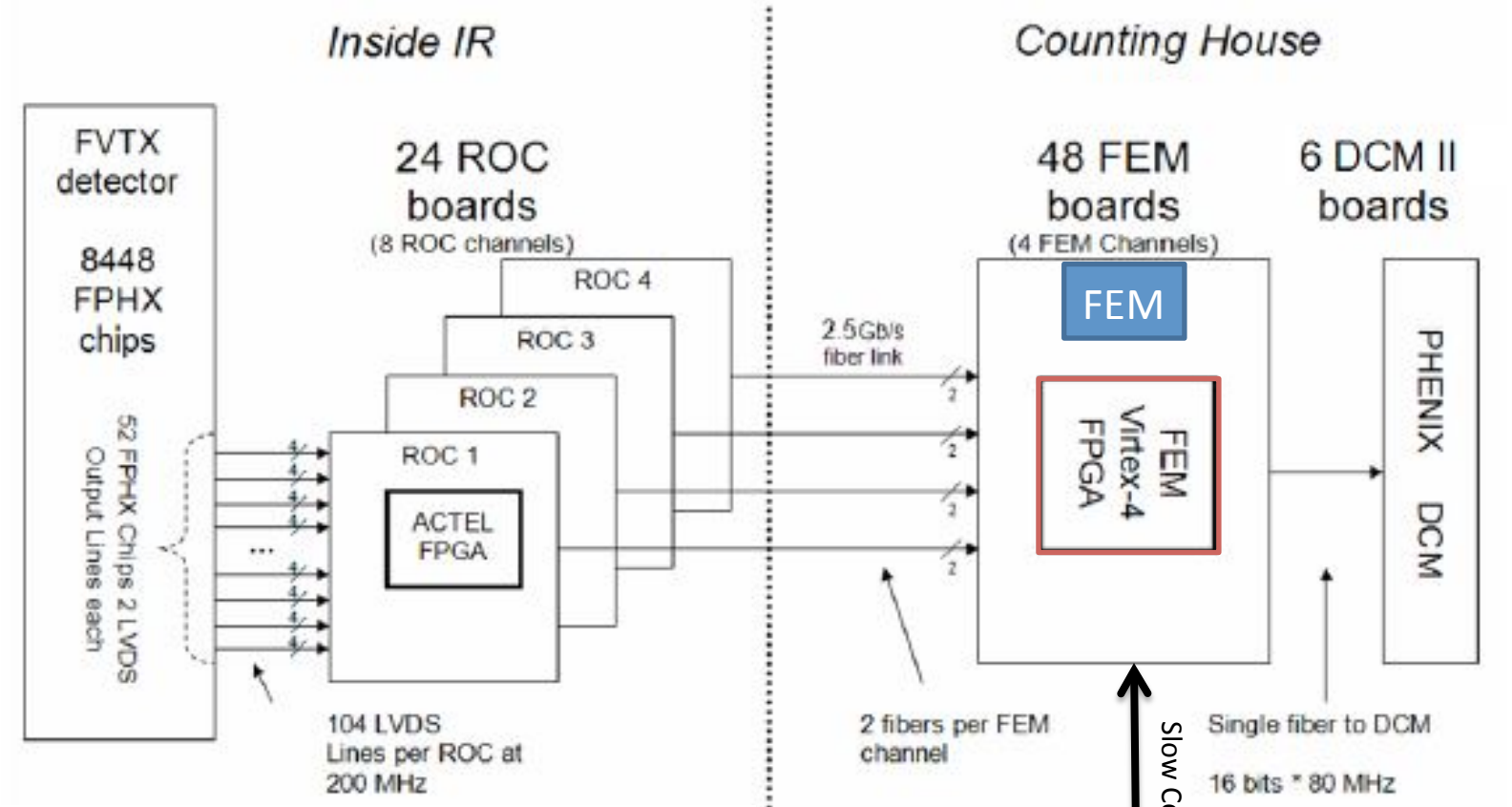
| # of FPHX Chips | FVTX | INTT |
|---|---|---|
| St-0 | 10 | 10 |
| St-1 | 26 | 10+10 |




"Y"- shape bus extender to maximum use of St-1 slots

Number of half ladder can be handled by a single ROC board:
4 x 1 + 4 x 2 x 3 = 28 half ladders.

# FVTX Readout Chain




We have 108 ladders.
Existing ROCs can accommodate :
24 x 28 = 336 Ladders.
Thus we do not require every single ROC slots to be fully functional.

# Summary

- INTT Readout Electronic chain is well-established and conservative. INTT is using FVTX Readout Chain Components, which was successfully working during PHENIX data taking
- The engineering design needs to be developed to layout ROCs. About 100cm bus extender needs to be developed to transport FPHX outputs to ROC.
- In order to adapt the FVTX Read Out Cards (ROCs), bus the extender needs to be customized to resolve the geometric constraints of existing ROCs to fit in the layout of input ports of ROCs.
- There are some existing FVTX electronics known to be not fully functional. However INTT requires less channels than FVTX, thus INTT does not necessarily require all FVTX readout chains to be fully functional.

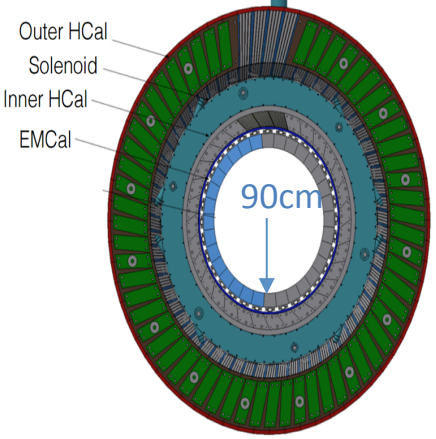
# BACKUP SLIDES

# Technical Descriptio

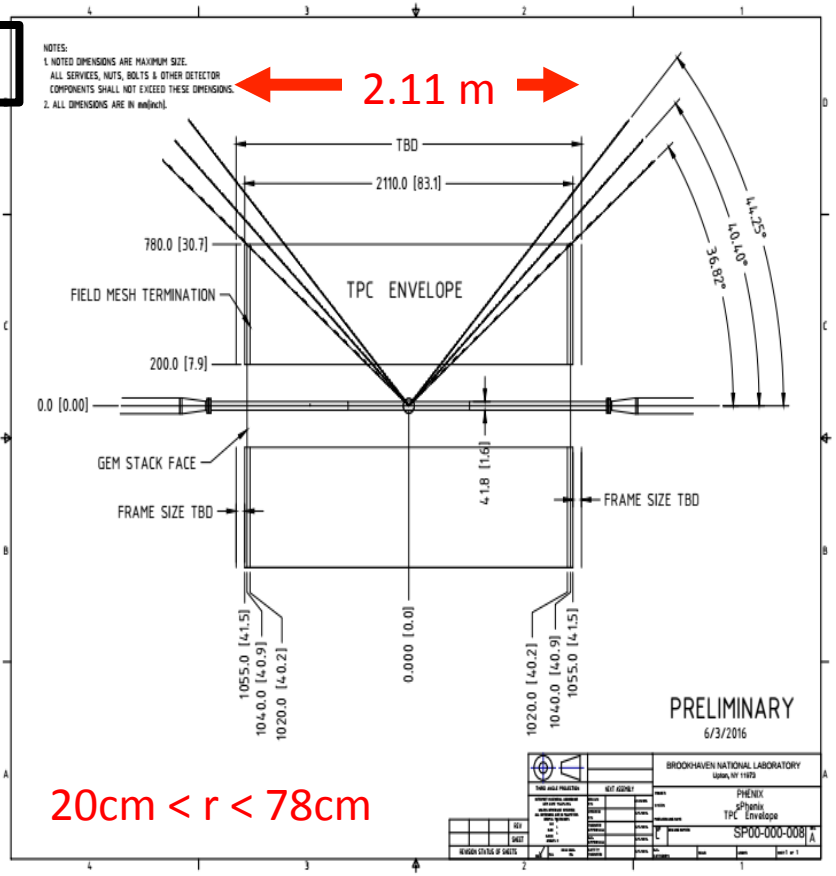
- Mechanical Constraints (magnet/EMCal-driven)
  - EMCal Mechanical constraint @ r=90cm.
  - $|\eta|<1.1$ or $Length \approx Diameter$
- Physics program accomplished via two toughest constraints:
  - Mass resolution sufficient to resolve Υ States.
    - $\sigma\downarrow m <100\ MeV/c\uparrow 2$ @ $m\approx 9\ GeV/c$
- Environmental constraints:
  - Central Au+Au multiplicity @ full RHIC
  - Full RHIC-II Luminosity (50-100 kHz ra w/in vertex)

Drives $\sigma_{r\phi}$<250μm

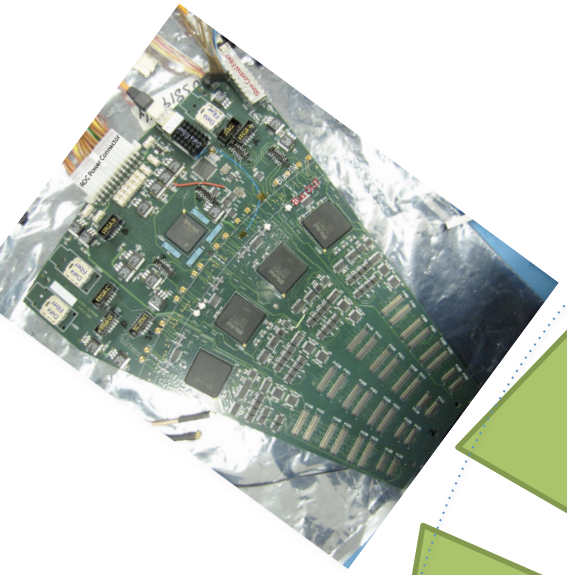
Drives gateless TPC

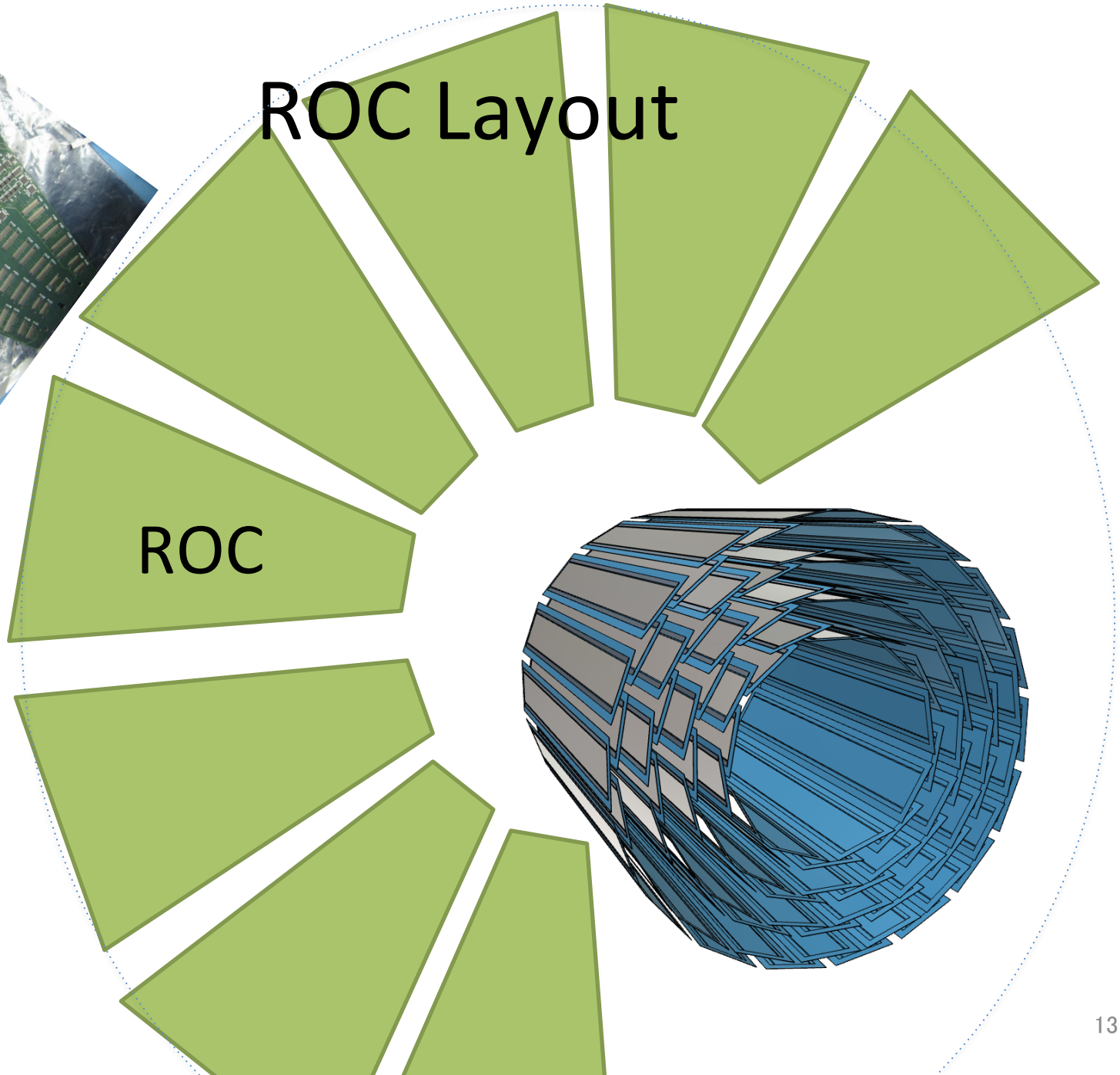




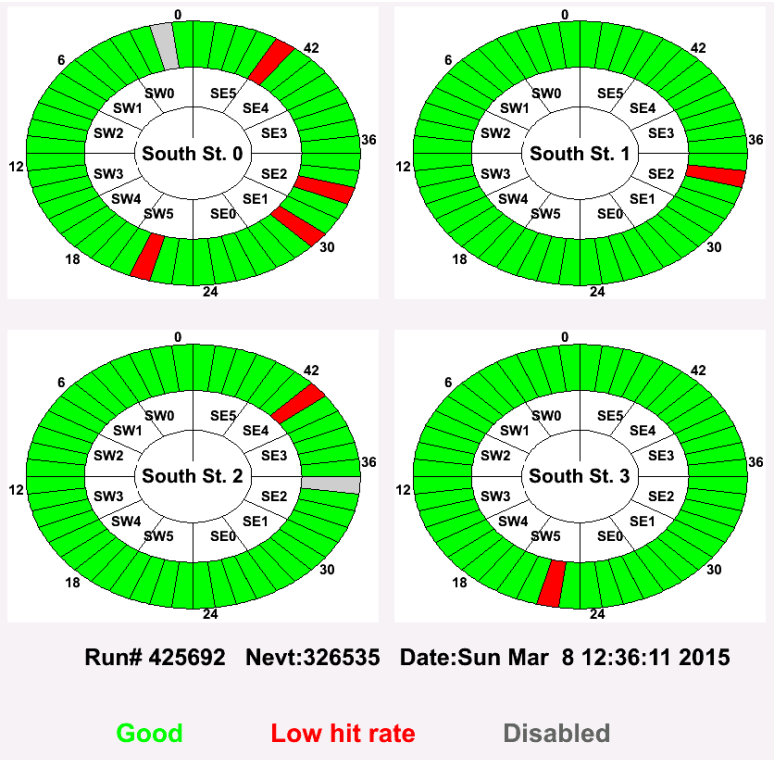


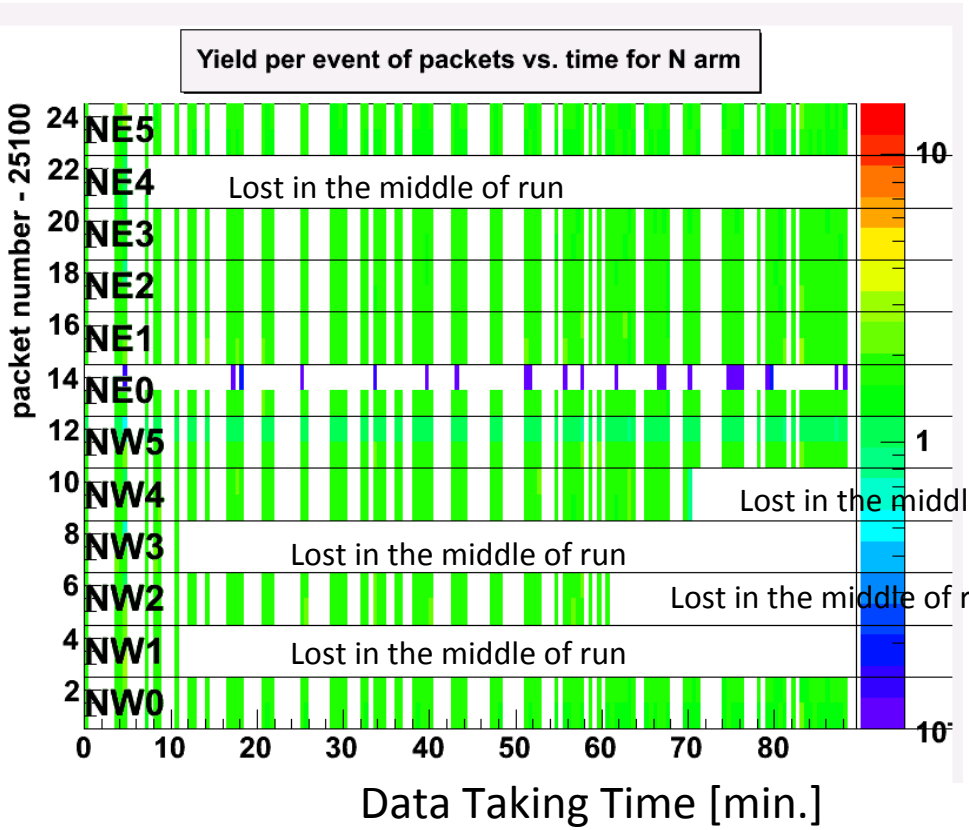
# ROC Layout





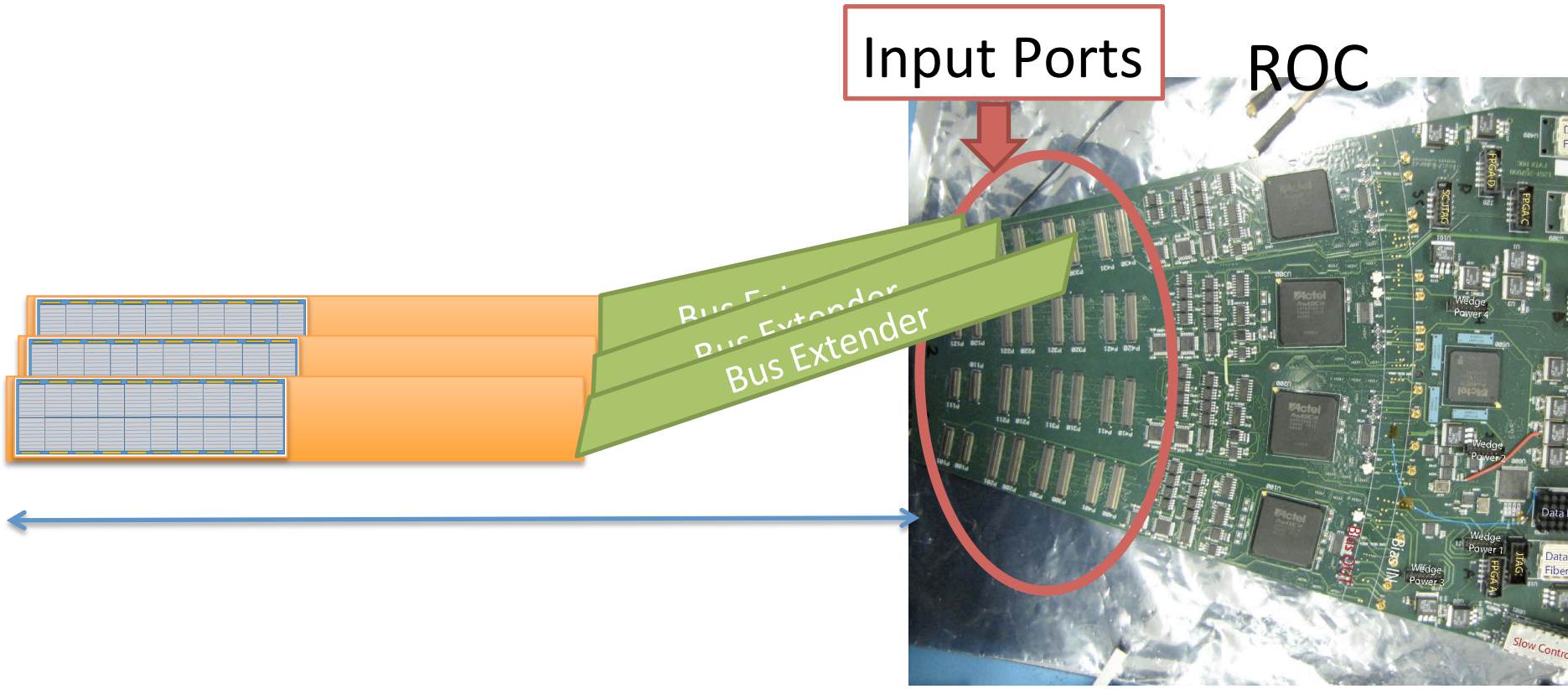
# Packet Drop Off Issue (1)




Some packets stops sending data in the middle of run. Once this occurs, the packet won't be recovered until the electronics are reset in the beginning of run routine. The present understand of the cause is a glitch in receiving beam clock (BCLK) signals in ROC.

# BUS Extender

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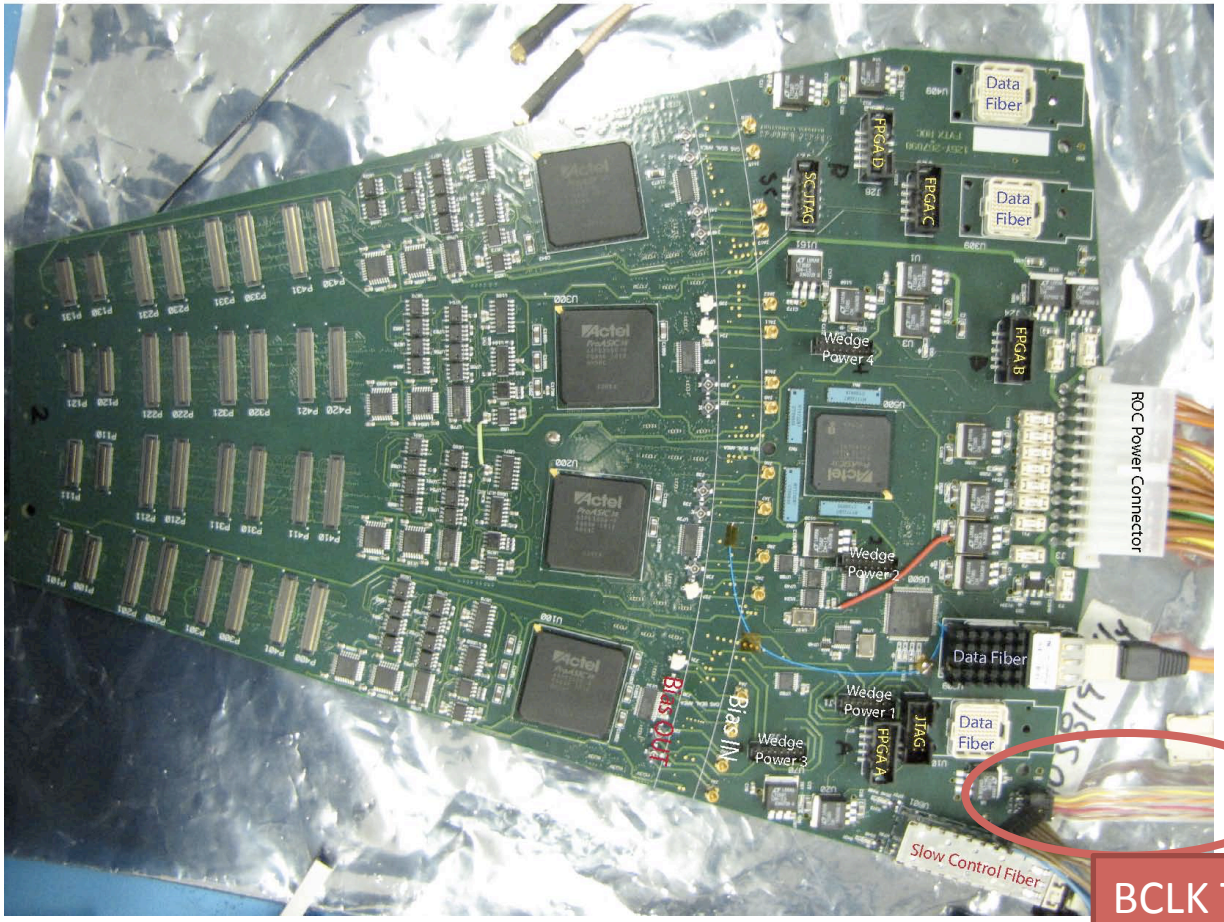
# Solutions?




1. Try to minimize the distance between ROC and BCLK distributor
2. Re-design the ROC board to receive BCLK via optical fiber.

BCLK Twisted pair